

Review of Previous Relevant Studies

Seattle Transit Study for Intermediate Capacity Transit

Submitted to:
City of Seattle Strategic Planning Office

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October 13, 2000



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INTRODUCTION

This Technical Memorandum provides a review of previous relevant studies and plans that either include major elements within the City of Seattle or were undertaken with a focus on City of Seattle. The primary purpose of this review is to determine what was learned or concluded from these earlier studies and to decide if this information is still valid and instructive for the purposes of this study. Secondary purposes of this review are to extract data that may be useful in developing corridor and route inventories, and performing ridership analysis and environmental assessments.

The following studies will be reviewed: RTA Ballard to Laurelhurst Study, RTA Rhododendron Line Study, Waterfront Streetcar Extension, Access Duwamish Study, Downtown Circulation Study, SR 522 Multi-Modal Study, Trans-Lake Washington Study, ITS Master Plan for the City of Seattle, King County Metro Bus Service Integration Proposal for Link Light Rail Locally Preferred Alternative, King County Metro Transit Speed and Reliability Program, Monorail Extension Study, and selected Elevated Transportation Company documents.

1. BALLARD TO LAURELHURST CORRIDOR STUDY, PLANNING AND ENGINEERING SERVICES FOR PHASE II OF THE METRO REGIONAL TRANSIT PROJECT, OCTOBER 1991.

OVERVIEW

The Ballard to Laurelhurst Corridor Study purpose was to “Determine the need for and the technical feasibility of major transit improvements in the Ballard/Laurelhurst corridor.”

EXISTING CONDITIONS & TECHNOLOGY

The transit technology addressed included Enhanced Bus, Urban Rail (LRT), People Movers, Personal Rapid Transit, and Terrafoil. Through the process of this study, all but enhanced bus and urban rail (LRT) were rejected based on fatal flaws.

In 1991, existing conditions in this corridor consisted of at-grade articulated trolley buses running at 10 minute headways. There were approximately 6,500 passengers traveling in each direction on a daily basis, for a total of 13,000 daily passengers.

DATA SOURCE/ASSUMPTIONS

Data included in the study are automated counts for then Route #43. Estimates of 2020 travel were derived by estimating increased demand based on service changes: travel time reduction and more frequent service. Using these two factors in combination produced directional, high-end demand estimate for the corridor. Ridership estimates were based on the assumption of 5 minute headways, but were non-specific to technology.

Base population and employment data for 1998 were obtained from PSCOG, as well as 2020 population and employment data. Population increases leading to increases in transit ridership were expected to be minimal. Employment increases however, were significant at 30,000 new jobs by 2020. Assuming the existing transit mode split of 30%, approximately 9,000 new transit trips could be expected by 2020.

This study reviewed technology feasibility only for facilities on 45th and Market Streets, it did not address other potential locations in this “corridor.”

EVALUATION CRITERIA

Evaluation criteria used to measure each technologies relative strengths and weaknesses included: additional corridor capacity, on-time performance, reduced travel times, access to disabled patrons, ability to negotiate steep grades, costs, impact on existing bridges, visual impacts, on-street parking impact, effect on auto operations, effects on pedestrian movements, required land acquisitions, impacts to cultural/historical resources, ease of construction, and impacts during construction.

RECOMMENDATIONS/CONCLUSIONS

Either Enhanced Bus service or Urban Rail (LRT) would be feasible alternatives for this corridor. Enhanced bus service leaves very little, if any, room for unanticipated demand and is more susceptible to roadway factors, such as weather, traffic, accidents, breakdowns, etc. LRT has greater passenger capacity and would be better able to accommodate additional demand. Additionally, most motorists would be less likely to disrupt LRT operations.

IMPLEMENTATION

The recommendations were not implemented.

Comprehensive Plan Compliance

All locations studied for the Ballard-Laurelhurst corridor are located on transit priority streets.

RELEVANCE TO ICT PROJECT

Provides an excellent source of information and a good base for technology analysis for the Ballard – Fremont – U-District corridor. Further technology analysis should reflect the findings of the study to ensure that future analysis in this corridor will be focused on the most appropriate technology.

2. ANALYSIS OF THE RHODODENDRON LINE CONCEPT, AT-GRADE LRT ON STATE ROUTE 99, PLANNING AND ENGINEERING SERVICES FOR PHASE II OF THE METRO REGIONAL TRANSIT PROJECT, SEPTEMBER 1991.

OVERVIEW

The purpose of the report was to investigate the preliminary feasibility of the Rhododendron Line in the State Route 99 corridor and its potential application for a surface LRT line constructed in the two center lanes.

EXISTING CONDITIONS & TECHNOLOGY

An HOV lane is available in the northbound direction from N. 115th Street to N. 145th Street, and is used by buses and carpools throughout the day. Both standard and articulated diesel buses are used in the Aurora corridor.

The transit technology addressed by the Rhododendron Line study is an at grade, semi-separate light rail transit facility.

DATA SOURCE/ASSUMPTIONS

Regional population and employment data from PSCOG.

EVALUATION CRITERIA

No evaluation criteria were presented or used in this study, as it was a preliminary feasibility study and evaluation of potential LRT application on SR 99.

RECOMMENDATIONS/CONCLUSIONS

No recommendations or conclusions were presented in this report. However, a number of potential difficulties were discussed and evaluated relating to the application of LRT in the center lanes of SR 99.

IMPLEMENTATION

At this time, light rail transit along Aurora Avenue has not been implemented.

Comprehensive Plan Compliance

Aurora Avenue and related streets (Alaskan Way, E. Marginal Way) are all included as Transit Priority Streets in the City of Seattle's Comprehensive Plan. Potential plan issues may arise at the regional level with the PSRC's Vision 2020 Plan.

RELEVANCE TO ICT PROJECT

The Rhododendron study provides documentation of conflicts and potential issues surrounding the application of LRT technology on SR 99. Analysis of LRT technology in the Aurora – Greenwood – Fremont – Downtown corridor should use this study as a starting point.

3. WATERFRONT STREETCAR EXTENSION STUDY, SEATTLE TRANSPORTATION, FEBRUARY 1998.

OVERVIEW

The purpose of this study is to identify and describe potential streetcar routes from the existing terminus at Broad Street to Seattle Center and South Lake Union. The identification of a least cost route to the monorail station at Seattle Center, as well as order of magnitude cost estimates for each potential route. Additionally, this study identifies right-of-way requirements and potential conflicts with utilities, traffic, parking and the community and the pros and cons associated with each potential route, as well as a route to the Seattle Center extending from the southern terminus.

EXISTING CONDITIONS & TECHNOLOGY

The waterfront streetcar runs approximately 2 miles between Broad Street at the north and 5th Avenue S. and S. Jackson Street at the south. The route, along Alaskan Way, is not in the street but does cross multiple streets along the 1.6 mile stretch. The streetcar runs in the middle of S. Main Street from Alaskan Way to 5th Avenue South, then along the west edge of 5th Avenue South to S. Jackson Street.

The Waterfront Streetcar system operates five double-ended Melbourne Class Q-2 streetcars dating from 1924 and can accommodate up to three cars running simultaneously. The streetcars are electrically powered through overhead lines.

DATA SOURCE/ASSUMPTIONS

Ridership for the potential routes was not projected. Historic Waterfront Streetcar ridership was presented and in 1998 was approximately 210,000 annual riders.

EVALUATION CRITERIA

No evaluation criteria were used in this project as the document was intended as a base of general information to aid decision makers from local governments and interested groups to evaluate the feasibility and desirability of a streetcar line extension.

RECOMMENDATIONS/CONCLUSIONS

The report did not present a preferred alternative, as the document was simply intended to aid in decision making about the feasibility of a streetcar line extension. Potential routes for the northend extension and a single route for the southend extension and there associated positive and negative aspects are presented in Table 1 on the following page.

Table 1
Potential Route Summary Matrix

Route	Cost (\$ M)	Pros	Cons
Connection from the Waterfront to Seattle Center			
Mercer Street Route	\$38	Provides link to Lower Queen Anne May shift traffic from Mercer to Broad Street	Longest route to Seattle Center High potential for utility conflicts High right-of-way requirements Will reduce already scarce parking on Mercer Large aerial structure would impact views
Thomas Street Route (At Grade)	\$25	Second lowest traffic impacts Lower cost Least complex construction	Steeper than desirable grade High right-of-way requirements Possible utility conflict (Alaskan CSO) Potential pedestrian conflicts in Seattle Center Large aerial structure would impact views
Thomas Street Route (Tunnel)	\$90	Lowest traffic impacts No grade issues Opportunity for underground pedestrian links between Center venues Preserves Seattle Center open space Tunnel could be extended east to South Lake Union	Very expensive Lengthy, complex construction Concerns about aesthetics and safety of underground route/stations Large aerial structure would impact views
Bay Street Route	\$41	Does not require right-of-way (ROW) at Myrtle Edwards Park Does not impact parking	Second most expensive alternative Requires easement to use vacated street ROW Longest aerial structure Potential for significant traffic disruption on Denny Way Streetcar maintenance building would require relocation
Broad Street Route	\$23	Shortest route to Monorail station Minimal traffic impacts compared to other routes Lowest cost No conflict with streetcar maintenance facility	Does not provide direct link to Lower Queen Anne Bypasses existing Broad Street Station Potential for minor traffic disruption on Denny and Broad Streets.
1st Avenue North Route	\$36	Minimal traffic impacts compared to other routes Serves lower Queen Anne No conflict with streetcar maintenance facility	Parking would be lost on 1st Avenue N. and Mercer Street Requires widening of 1st Avenue N. Second longest route
Route Cost (\$ M) Pros Cons			
Connection from Seattle Center to South Lake Union			
Roy Street Route	\$26	May help reduce congestion on Mercer Street Creates bike/ped connection between Seattle Center and South Lake Union	Relatively high construction costs Right-of-way and/or access issues on Roy Street Aerial structure will affect views
Thomas Street Route	\$38	Traffic, parking and view impacts modest compared to other routes	Only feasible as extension of Thomas Street tunnel option Most expensive route Tunnel lacks charm of at-grade section
Republican Street Route	\$33	Minor traffic, parking and business impacts	Relatively expensive alternative Long aerial structure would affect views Aerial crossing of Aurora Avenue may be disruptive to traffic
Broad Street Route	\$17	Most direct connection Uses existing crossing of Aurora Avenue Least expensive alternative	Requires significant revisions to traffic circulation
Connection from South Jackson to Seattle Center			
General CBD Route		Costs are estimated to be less than an extension from the northern terminus. Grades are no greater than 6.8% for potential routes (1st, 2nd, 4th and 5th Avenues) Entire route could be constructed at-grade Conflicts with BNSF railroad tracks are avoided Streetcar route would appeal to a broad variety of users and may create an incentive for TOD	ROW, resulting in fewer travel lanes and loss of parking. The opportunity for construction cost escalation is greater than for other areas Sidewalk space may be encroached upon by streetcar stops and may impact business access

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IMPLEMENTATION

At this time, an extension of the Waterfront Streetcar has not been undertaken.

Comprehensive Plan Compliance

On average, most potential routes are not located on the transit priority network in the Seattle Comprehensive Plan.

RELEVANCE TO ICT PROJECT

The Waterfront Streetcar Extension study provides an excellent base of knowledge for streetcar circulation options and feasibility in the Downtown & Environs ICT corridor. This study can be used as an excellent starting point if further analysis of streetcar technology were to be undertaken in the Seattle ICT project, as it provided alignment routes and mileage, average travel speed, and estimated costs, for various routes in the downtown area. Study focused mainly on provision of additional streetcar service to the north.

4. ACCESS DUWAMISH STUDY

OVERVIEW

The Duwamish Access Study addresses the West Seattle – Delridge – Downtown ICT corridor. This study was a collaborative effort between the City of Seattle and the Port of Seattle (in conjunction with the WSDOT OUM), to identify and analyze the access and mobility problems of the North Duwamish area, as well as evaluate a wide range of specific solutions to alleviate congestion, reduce modal conflicts, and eliminate safety problems.

EXISTING CONDITIONS & TECHNOLOGY

This focused on mobility issues of all modes utilizing the North Duwamish area, and did not specifically focus on transit. However, transit needs were taken into consideration as a separate mode by the study team.

The technology focus was generally on mode separation to reduce congestion and safety problems.

DATA SOURCE/ASSUMPTIONS

No data sources were identified. However as the Project Summary Report was the only document available for review, it is assumed that the full document has provided data source documentation from the City of Seattle, the Port of Seattle, the WSDOT and other agencies.

Total costs analysis was undertaken as part of this study and has been included in the Summary Report. The Summary Report, however, does not include a detailed breakdown of specific project costs.

EVALUATION CRITERIA

Criteria used to evaluate potential projects for the Access Duwamish Study included:

- ◆ Capital Cost
- ◆ Operations & Maintenance Cost
- ◆ Traffic Network Implications
- ◆ Rail Network Implications,
- ◆ Safety Implications
- ◆ Effect on Emergency Vehicle Access
- ◆ Port of Seattle Terminal Access Implications
- ◆ Institutional & Legislative Impact
- ◆ Right-of-Way Impacts

- ◆ Parking Implications
- ◆ Air Quality & Energy Implications
- ◆ Cost Effectiveness
- ◆ Ability to Fund
- ◆ Implementation Timeframe

RECOMMENDATIONS/CONCLUSIONS

Projects recommended by the Access Duwamish study team include an endorsement of **FAST Corridor Phases 1 and 2** projects, which are listed below:

- ◆ SR-519 Intermodal Access Project (Phase 1)
- ◆ Spokane Street Viaduct Widening
- ◆ East Marginal Way and SR-99 Ramps
- ◆ SR-519 (Phase 2)
- ◆ Lander Street Overcrossing

Other Railroad Grade Separations

- ◆ N. Waterfront Access (Broad Street)

Highway Access Improvements

- ◆ SR-99 Interchange On-Ramp
- ◆ Directional Signs to Port Terminals

Arterial Improvements

- ◆ Intersection Improvements
- ◆ Pavement Rehabilitation
- ◆ Construction Notification System
- ◆ Advanced Technology for Traffic Management
- ◆ East Marginal Way Truck Emphasis Route/Separated Bikeway

Railroad Operations Improvements

- ◆ Off-Mainline Rail Improvements
- ◆ Train Crossing/Signal Coordination

IMPLEMENTATION

None of the recommended projects have been implemented. Most all are waiting for additional funding. The FAST Corridor Phase 1 projects of SR-519 Intermodal Access Project (Phase 1) and the Spokane Street Viaduct Widening are the closest to being fully funded.

Comprehensive Plan Compliance

All recommended project alignments have been noted under either the Heavy Commercial Vehicle Priority Network or the Transit Priority Network.

RELEVANCE TO ICT PROJECT

The Access Duwamish Study provides a thorough and comprehensive review of intermodal access issues in the North Duwamish area, revealing the complexity of mobility and the need for mode separation. The results of this study should be incorporated into any West Seattle – Delridge – Downtown and Downtown Circulator ICT recommendations.

5. DOWNTOWN CIRCULATION STUDY, DOWNTOWN CIRCULATION ADVISORY GROUP RECOMMENDATION TO SEATLAN, NOVEMBER 1998.

OVERVIEW

The ICT corridor address by the Downtown Circulation Study is the identified Downtown Seattle & Environs area. This is more of a policy directive for additional analysis and refinement of their proposed recommendations. The target audience is King County, the Seattle Transit Initiative Team and Sound Transit.

EXISTING CONDITIONS & TECHNOLOGY

Existing facilities and technology include a mix of trolley and diesel buses, and locations with dedicated transit lanes, as well as signal optimization.

Technology focus is on re-routing the existing trolley and diesel buses, noting physical and economic constraints for extension of the Waterfront Streetcar. Circulator service is dependent on the assumption of adequate capacity on 4th Avenue after the downtown tunnel is converted to light rail use. High service frequencies, of 5 to 7 minutes, during most of the day for seven days a week.

DATA SOURCE/ASSUMPTIONS

Most data noted are for jobs and employment data, land-use data, typical mode split information and existing transit ridership from the following sources: Seattle Comprehensive Plan (1994), PSRC Urban Centers Baseline Report (1996), the City of Seattle (1998) Urban Land Institute Market Profile (1997), and ridership numbers from King County Metro, Community Transit, Pierce Transit, Washington State Ferries, Amtrak and Seattle Monorail. Projected ridership on Sound Transit's light rail and Sounder commuter rail were from the Seattle Intermodal Environmental Impact Statement.

EVALUATION CRITERIA

Evaluation criteria used to select recommended strategies for the downtown circulation study included:

- ♦ Simplicity – creation of a basic grid or neighborhood circulation system.
- ♦ Improvement of connection between downtown Seattle destinations – filling in the gaps
- ♦ Political and economic feasibility – cost-effectiveness and good balance between downtown travel modes.

RECOMMENDATIONS/CONCLUSIONS

Key strategies developed by the Downtown Circulation Advisory Group are listed below.

1. Simplify downtown transit circulation by consolidating local routes into key corridors and scheduling transit service to provide even headways between buses
2. Improve transit speed and reliability to maximize efficiency and effectiveness.
3. Establish a downtown way-finding system
4. Increase transit custom safety, comfort and convenience
5. Provide and maintain pedestrian friendly streets, walkways and in some cases alleyways
6. Complete the downtown bicycle network, while minimizing conflict between bikes and pedestrians and bikes and transit.

Strategy #1 involves rerouting and consolidating Metro's existing routes. All north-south bus routes would be routed to either 1st or 3rd Avenues. Buses running on 1st Avenue would travel to the west of the Seattle Center and Queen Anne and down 1st to the west of Safeco Field. Buses running on 3rd would travel to the east of Seattle Center and others through the Denny Triangle and along Fairview, from the south buses would travel along S. Jackson and Rainer Avenue or 12th Avenue, or out Yesler Way and Jefferson Street. East-west bus routes would be re-routed to run on either Denny Way, Pike/Pine or Madison/Marion Streets. A downtown circulator would travel on Alaskan Way, S. Jackson Street, 4th & 5th Avenues and Wall Street.

Strategy #2 involves a mix of vehicle, scheduling, and roadside improvements. Vehicle improvements would center around fare collection (Smart Card or modification of the free ride zone). Scheduling improvements would include even spacing of buses in the downtown area and coordinated special event management. Preference for roadside improvements would include TSM strategies, placement of bus stops, parking restrictions, and optimization of signals.

Strategy #4 focuses on transit customer safety, comfort and convenience, mainly through improvement and provision of transit shelters, benches, lighting, signage, maps and schedule information. Safe and clean transit stops, support for private vendor participation for the provision of transit amenities. Reduce transit noise and pollution through use of electric trolley buses or alt. fuel vehicles.

Strategy #5 allows for the provision of pedestrian oriented amenities. Assessment of pedestrian level of service at all transit stop locations. Provision of adequate pedestrian capacity at light rail and commuter rail locations was also addressed.

Strategy #6 focuses on completing bicycle connections in the downtown area – in order to minimize conflict between bicyclists and transit.

IMPLEMENTATION

At this time, none of the recommended strategies have been implemented

Comprehensive Plan Compliance

It appears that a portion of the desired transit corridors would be on transit priority streets. A portion of the Downtown Circulator on Alaskan Way, the First Avenue Corridor on Elliott Avenue and Queen Anne Avenue, the Denny Way Corridor on Denny Way, the Third Avenue Corridor B on Fairview Avenue, and the Pike/Pine Corridor on Pine St.

RELEVANCE TO ICT PROJECT

This report provides a comprehensive look at transit circulation in the selected Downtown & Environs ICT corridor, touching on the complexity of the existing bus routing system and the need for a downtown circulator for both tourism and downtown population use. As this study is part of the community planning process undertaken by SEATLAN and the Downtown Urban Center Planning Group (DUCPG) their results should be reflected in our findings.

6. SR 522 MULTI-MODAL PROJECT, TWENTY YEAR TRANSPORTATION PLAN COMPONENTS FOR THE LAKE CITY WAY CORRIDOR (SR 522) IN THE CITY OF SEATTLE, MARCH 1999.

OVERVIEW

The purpose of the SR 522 Multi-Modal Project is to guide the re-development of the SR 522 corridor from I-5 to I-405 over the next 20 years.

The study area of this project is within the Lake City – Northgate – Ballard – Downtown Seattle ICT corridor.

EXISTING CONDITIONS & TECHNOLOGY

Existing conditions for the Lake City corridor within the City of Seattle include diesel buses, both standard and articulated. Roadway characteristics do not include any transit priority or traffic system management elements at this time.

Transit technology address in this study is mainly in Traffic Systems Management and to a lesser degree Bus Rapid Transit. Most improvements recommended by this study are for transit queue jumps, transit signal priority, signal optimization and parking removal.

DATA SOURCE/ASSUMPTIONS

AM and PM peak period traffic counts at selected intersections were collected in the 1997/1998 timeframe. Vehicle projections for the year 2020 were performed as part of this study.

RECOMMENDATIONS/CONCLUSIONS

1. Business access and transit lanes for both direction of travel from 20th Avenue NE to NE 123rd Street and from NE 130th Street to NE 145th Street;
2. Transit queue jumps: northbound at NE 123rd Street/30th Avenue NE and southbound at NE 130th Street;
3. An efficient and effective system of transit signal priority with an upgraded, coordinated and optimized system of signals;
4. Access management strategies, as needed to insure the safe operation of this corridor for all modes, while providing effective business and community access;
5. Creation of a more pedestrian friendly environment (continuous sidewalks, landscaped planting strips and related amenities);
6. Improved crosswalk, pedestrian signalization, and access management measures designed to enhance pedestrian safety;

7. Reconstruction in accordance with the roadway sections (all noted roadway improvements);
8. Improvements to the intersections at 15th Avenue NE and NE 80th Street to reduce overall delay, improve transit operations, and reduce cut-through traffic on residential streets. The improvements are intended to reduce conflicts between through and left-turning traffic through the addition of left-turn lanes.

IMPLEMENTATION

At this time, none of the above noted business access, access management and transit lane recommendations have been implemented along Lake City Way within the City of Seattle. The following paragraphs provide detailed information on the implementation process.

Implementation of business access and transit lanes between 20th Avenue NE and NE 123rd Street and between NE 130th Street and NE 145th Street is dependent upon 2 factors: a reconstruction project in the Lake City Way ROW, which would cause curb lines to be relocated and redevelopment of properties or a change in use that would allow the City of Seattle to require the owner to reconstruct the sidewalk and curb line. In locations that do not meet the above noted conditions, the City will make securing funding and developing plans a high priority when the number of buses in the Lake City Way corridor reaches 35 one-way bus trips per hour, or when the number of passengers reaches 1,400 per one-way peak hour.

Prior to the implementation of business access and transit lanes, additional right-turn/transit queue jump capacity may be added at signalized intersections through re-channelization and parking removal – when congestion at signalized intersections becomes severe enough that transit signal priority is no longer effective without right-turn/transit queue jumps.

Implementation of access management will be undertaken to address potential safety problems and to prevent future problems as traffic volumes on Lake City Way increase. The following guidelines will be used to assess problems and select appropriate access management treatments: median restrictions to remedy driveway and un-signalized intersection locations experiencing 2 or more accidents per biennium; left turn restrictions to properties within 230 feet of signalized intersections or where peak queues extend beyond 230 feet of a signalized intersection; or restriction of left-turn access/egress for new (re)development that generates at least 15 vehicles per hour in the peak period.

Comprehensive Plan Compliance

The SR 522/Lake City Way has been designated as a transit priority street in the Seattle Comprehensive Plan.

RELEVANCE TO ICT PROJECT

The SR 522 multi-modal project provides insight into WSDOT's plans for SR 522 that will enhance transit service on this facility within the City of Seattle and as part of the Lake City – Northgate – Ballard – Downtown ICT corridor. Transit technology planning for this corridor should be undertaken to reflect the proposed plans for SR 522.

7. TRANS-LAKE WASHINGTON STUDY, FINDINGS AND RECOMMENDATIONS, WSDOT OFFICE OF URBAN MOBILITY, JULY 1999

OVERVIEW

The Trans-Lake Washington Study was tasked to recommend a set of reasonable and feasible solutions to improve mobility across and around the north end of Lake Washington. The Study Committee identified four problems that Trans-Lake solutions should address; each exists today and will become more critical in the future.

EXISTING CONDITIONS & TECHNOLOGY

The Study Committee identified four problems that Trans-Lake solutions should address; each exists today and will become more critical in the future.

1. Land use and transportation systems are not integrated in their planning and implementation
2. The transportation system suffers from extensive congestion
3. Reliability and safety of the system are impaired
4. Neighborhoods, business centers and the environment are impacted

Existing conditions on SR 520, within the City of Seattle, consist of 2 general purpose lanes in each direction, a queue bypass lane is available from southbound Montlake Boulevard to eastbound SR 520.

Both standard and articulated diesel buses use the bridge and related ramps.

DATA SOURCE/ASSUMPTIONS

Both ridership and cost estimate data is available for the 8 solution sets evaluated by the Study Committee.

EVALUATION CRITERIA

A selection of the Study Committee's "guiding principles" related to transit and the ICT study is presented below.

- Integration of urban areas to build on the positive inter-relationships among the communities adjacent to the Trans-Lake corridor
- Balance is needed among modes, corridors, and systems
- Options recommended should provide viable transportation choices and increase the choices among those.

- Whatever decision moves forward should be sufficiently flexible to accommodate new ideas and technologies.

RECOMMENDATIONS/CONCLUSIONS

The Study Committee presented recommendations by corridor, those recommendations pertaining to the Seattle ICT study are noted below.

Recommendations for SR 513 (Montlake Boulevard)

- Request USCG to keep the Montlake Bridge down during the evening peak period (3-7pm)
- Examine bus stop locations to improve transit priority on Pacific Avenue and Montlake Boulevard.
- Study southbound HOV/transit lane possibilities, in conjunctions with local neighborhoods.
- Improve traffic information systems north of 45th Street, approaching SR 520 southbound to Montlake.

Recommendations for SR 522

Transit lanes, signal priority, bicycle, pedestrian and safety improvements along SR 522, as called for by the SR 522 Multi-modal Corridor study. East-west connectors to and from I-5, as appropriate were also recommended for implementation.

Recommendations for SR 520

The EIS should evaluate the following combinations of additional transportation elements in each direction on SR –520

- 1 HOV lane in each direction
- 1 HOV lane in each direction and high capacity transit
- 1 HOV lane in each direction and one general purpose lane in each direction
- 1 HOV lane in each direction, high capacity transit, and one general purpose lane in each direction

Recommendations of I-90

Continued study of Sound Transit's proposal to establish 2-way HOV/transit operation on I-90. I-90 should remain convertible to include high-capacity transit in the future.

Recommendations for High-Capacity Transit

High capacity transit in the SR 520 corridor should be a preference and can include other alignment options, including an exclusive right of way, should be considered. However, implementation of high-capacity transit should not come at the expense of overall HOV capacity.

Recommendations for Transportation Demand Management and Transportation System Management

Various TDM and TSM recommendations were presented, as well as a the further study of regional pricing measures.

IMPLEMENTATION

Major recommendations from the Trans-Lake Washington study are for further study in an EIS and therefore, have not been implemented. At this time, none of the short-term recommendations have been implemented either.

Comprehensive Plan Compliance

It would be expected that any recommendations put forward after the EIS would be in compliance with the City of Seattle's Comprehensive Plan. Furthermore, all proposed recommendations are located on major roadways that are on the Transit Priority Network.

RELEVANCE TO ICT PROJECT

The results of this process and the EIS are important guides to future actions on SR 520, SR 513 and SR 522, as all are roadways included in or adjacent to the selected ICT corridors. It will be important to select and guide future ICT corridors in the City of Seattle, with this study in mind, to take advantage of potential linkages and to ensure that no alternatives or options are precluded.

8. CITY OF SEATTLE ITS MASTER PLAN, IBI GROUP, ET AL., DECEMBER 1998.

OVERVIEW

The purpose of this project is to develop and ITS Master Plan for the City of Seattle and design guidelines for specific ITS field devices that are operated from and Enhanced Transportation Management Center (TMC). Selection of ITS projects and components included a review of existing ITS components, identification of needs and potential project areas, review for compliance with the National ITS Architecture to define a set of candidate projects. The candidate projects were then phased according to various issues such as immediacy of need, funding availability, and determination if the project is a building block for future projects.

EXISTING CONDITIONS & TECHNOLOGY

There are two transit signal priority demonstration projects in the City of Seattle, on SR 99 North and on Rainier Avenue South. The State Route 99 North project is underway and the Rainier Avenue South project is in place.

The City of Seattle already operates signal coordination and optimization strategies in certain locations, but no comprehensive signal system is in place at this time.

DATA SOURCE/ASSUMPTIONS

As this is a Master Plan, it does not contain specific ridership type of information. It does, however, include cost information for high priority projects.

EVALUATION CRITERIA

Project phasing and priority selection were based on the following criteria:

- Priority: Assume this is a ranking of importance (1 – 5, 1 being highest)
- Phasing: Assume this is a ranking of implementation ability (near, mid, long term)
- Overall Importance: Qualitative parameter (professional judgement)

RECOMMENDATIONS/CONCLUSIONS

Thirteen Recommended Improvement Packages (RIPs) were developed based on ITS needs and priorities. Approximately 4 RIPs include elements that have the potential to affect transit within the City of Seattle: Transit, Safety Improvement, Traffic Signal Control, and Event Management.

1. The **Transit RIP** includes Transit Signal Priority, Transit Information Displays, and Transit Shelter Safety. Transit signal priority allows on-vehicle AVI technology to communicate with

traffic controllers to pre-empt the signal sequence and allow the transit vehicle to proceed through the intersection. Locations chosen for Transit Signal Priority include:

- Lake City – Northgate – Ballard – Downtown ICT corridor (Lake City Way from I-5 to NE 135th Street, 15th Avenue NW from 85th to the Magnolia Bridge)
- Aurora – Greenwood – Fremont – Downtown ICT corridor (Aurora from Queen Anne Drive to N 145th Street)
- U-District – Madison – Central Area – Columbia City – Downtown ICT corridor (Rainier Avenue S. from S. Othello St. to I-90)

Transit signal priority is identified as a near term priority project.

Transit information displays would obtain information from the TransitWatch system and display them on an LED monitor at heavily traveled shelters (or at a kiosk) to display route and vehicle specific information (bus arrival, delayed bus, missed bus). Initial locations for “enhanced” transit information displays include 2 in the A-GW-F-D corridor (near 85th), 2 in the B-F-UD corridor (on 45th), 1 in the Downtown Corridor (near Mercer), 1 in the BH-CA-CH corridor (Pine & Broadway), and 2 in the WS-D-D corridor (Roxbury area and Junction area).

Transit shelter safety would encompass installing some communication device or line, such as a call box or panic button. Both are listed as near-term for prototype or test locations, with further implementation and phasing based on success of testing.

2. The **Safety Improvement** RIP includes School Zone Warnings, Pedestrian Crossing Improvements, and Safety Call Boxes. Clearly, the safety improvements noted would increase transit riders safety while arriving or departing from transit stops and shelters, as well as waiting for transit vehicles. Specific technology would consist of signage, lighting, changeable displays, pedestrian sensors or control boxes at intersections and call boxes. All improvements have a generalized near term phasing plan.

3. The **Traffic Signal Control** RIP includes transit oriented ITS projects that include: Signal Coordination and Optimization and Real-Time Traffic Adaptive Control.

Signal coordination and optimization would simply coordinate and optimize traffic signals along key corridors throughout the city. Most major streets located within the chosen ICT corridors have been selected for signal coordination (a map of all streets is presented in the ITS Master Plan). This has been recommended for near term implementation.

Real-Time traffic adaptive control would entail automatic adjustment of signal timings based on real-time traffic conditions, monitored by in-pavement equipment (vehicle detectors). This is a medium term implementation project.

4. The **Event Management** RIP includes a strategy that would make transit usage during events easier and faster. The first strategy is the Event Information Database and Signal Coordination. This strategy would allow for the creation of a centralized database for all traffic generating events in Seattle, allowing for signal modification and coordination in response to events as they arise. Streets affected by signal modification and coordination are all in the Downtown ICT corridor. This strategy has been recommended for near-term development.

IMPLEMENTATION

At this time, those ITS demonstration projects noted under the existing conditions section of this review are in place, but it is unclear what other noted ITS projects have been undertaken by the City since this report was published.

Comprehensive Plan Compliance

ITS elements relating to transit are all located on or near transit priority streets as identified in the City of Seattle Comprehensive Plan.

RELEVANCE TO ICT PROJECT

Excellent source of future improvements that will enhance transit service speed and reliability within the City of Seattle. Selection of specific ICT routes should be made in conjunction with the City of Seattle ITS Master Plan.

9. BUS SERVICE INTEGRATION PROPOSAL FOR SOUND TRANSIT'S CENTRAL LINK LIGHT RAIL LOCALLY PREFERRED ALTERNATIVE, KING COUNTY METRO SERVICE DEVELOPMENT DIVISION, APRIL 1999

OVERVIEW

This document provides a proposed bus service integration scheme for King County Metro Transit and Sound Transit's Central Link light rail locally-preferred alternative.

EXISTING CONDITIONS & TECHNOLOGY

Existing conditions at each proposed light rail station vary considerably. All bus routes, ridership, and frequencies are presented in tabular format, with the corresponding light rail station areas they could logically serve.

DATA SOURCE/ASSUMPTIONS

Bus routes, service frequency, and ridership are from Fall of 1998. Station design concepts were current as of mid-March 1999.

EVALUATION CRITERIA

Bus services considered for re-routing to accommodate Central Link light rail station locations were those that operate within one-quarter mile of the station.

RECOMMENDATIONS/CONCLUSIONS

Numerous proposed bus service route changes were proposed for each station area. A map for each station is presented that depicts specific bus routes as well as bus circulation around the station area. Also presented in this document is proposed service frequency levels for each route and the associated supporting capital facilities, such as bus layover space, active bus zone space, operator parking and comfort facilities, needed at each station for optimal bus service integration.

IMPLEMENTATION

This document presents King County Metro's best projection of bus service integration needs at this time, with the information available about station locations and affordable bus service changes. The service integration plan presented in this document does not reflect any community process, which will need to be undertaken prior to implementing any bus schedule and route changes.

Comprehensive Plan Compliance

It is assumed that bus service changes proposed would be acceptable based on their existence at this time, and the importance of creating an integrated transportation system for the future.

RELEVANCE TO ICT PROJECT

This document presents King County Metro's best estimation of future bus service changes for the future that are related to Central Link light rail service and stations. Potential ICT routes should be mindful of these changes and should reflect the proposed changes to the extent possible, given their proposed status.

10. SUMMARY REPORT, PROPOSED TRANSIT SPEED & RELIABILITY PROGRAM 1994 – 2000, KING COUNTY DEPARTMENT OF METROPOLITAN SERVICES, TRANSIT CAPITAL PLANNING & DEVELOPMENT DIVISION, APRIL 1994.

OVERVIEW

The purpose of this effort was to develop a departmental consensus on what new projects should be initiated by the Speed and Reliability Program for the 6 year, 1994 to 2000 period. The Speed and Reliability Program emphasizes corridor level projects that improve transit schedule reliability or reduce transit travel time.

EXISTING CONDITIONS & TECHNOLOGY

Existing roadway conditions in 1994 for the noted project locations did not include any transit priority or HOV treatments.

Standard and articulated diesel coaches are in existence on all noted project streets. Standard and articulated trolley buses use 3rd Avenue, except the 10/12 route that is on 1st Avenue. No technology changes were suggested.

DATA SOURCE/ASSUMPTIONS

For this planning level effort, previous studies were review in order to compile a list of preliminary candidate projects, studies included: the King County Arterial HOV Program (1993), Identification of Metro Speed and Reliability Problem Locations (1990), and various proposed improvements from the Regional Transit Project (1993). Other data compiled include specific routes benefiting from proposed changes, assessment of transit problems on project streets, and an inventory of relevant operational characteristics including transit LOS, PM peak period passenger volume, transit variability index and the number of weekday trips and riders.

The list of preliminary candidate projects were then reviewed using professional judgement to identify potential improvements and their associated feasibility.

EVALUATION CRITERIA

The Technical Support Group was formed of persons with considerable transit field experience and expertise to discuss and evaluate proposed projects. Individual TSG members were then asked to rate the projects (for their specific district) based on priority and confidence level. The priority score rated the importance of the proposed project, not against the other projects but on its own merits, on a scale from 1 to 5 (5 noting the highest score). The confidence score was a measure of how sure the evaluator was in their ability to measure this particular project. Project priority scores were then weighted based on the confidence level associated with each vote.

Lastly, a supervisory review team integrated the district level project ranking into a single system recommendation, combining individual projects into larger programs to create corridor level recommendations.

RECOMMENDATIONS/CONCLUSIONS

One of the three recommendations from this process resulted in a recommendation for improving transit operations on surface streets in the Seattle central business district, the Seattle CBD Transit Flow Improvement Project. As part of this recommendation the following specific improvements were noted:

- 1st Avenue signal progression
- 1st Avenue parking management
- Peak hour left-turn prohibition at Pike Place Market, from 1st Avenue
- Signal progression/priority on 3rd Avenue
- Transit lane on Olive and Howell Streets and transit signal priority.

Further, it was recommended that pre-design studies be undertaken for each of proposed project recommendations to include scope, schedule and budget with the local affected jurisdictions.

An additional outcome of this process was the identification of high priority spot improvements for the following locations within the designated ICT corridors:

- Lake City-Northgate-Ballard-Downtown – Signal Priority at 5th Avenue NE and Northgate Way
- Downtown and Environs – James Street from 3rd to 9th Avenues signal timing improvements or implementation of transit signal priority.

IMPLEMENTATION

Various improvements have been made, including signal re-timing on 1st and 3rd Avenues, spot parking removal on 1st Avenue, and a transit queue jump at Howell and 9th Avenue. Full-scale signal priority has not been undertaken in the downtown area at this time.

RELEVANCE TO ICT PROJECT

This report provides a source for localized Downtown & Environs ITC corridor proposed improvements to be considered when evaluating circulation needs and route selection.

11. MONORAIL EXTENSION STUDY, TDA INC., OCTOBER 1994

OVERVIEW

The purpose of the Monorail Study was to consider extending the existing monorail system and evaluate such an extension for any fatal flaws. The study considered physical, technological, financial and political aspects and ridership potential of an extension, with an evaluation of the extension using a baseline system.

The Monorail Study addresses the noted Downtown Seattle & Environs corridor discussed in the Seattle ICT Corridor Study.

EXISTING CONDITIONS & TECHNOLOGY

The existing monorail system runs from the Westlake Center, at 4th Avenue and Pine Street, to the Seattle Center at Broad Street and 5th Street, and is just under 1 mile in length.

The transit technology assessed is the Bombardier M-VI.

DATA SOURCE/ASSUMPTIONS

Ridership estimates are based on existing ridership (1994), potential Seattle Commons Plan implementation (estimated 5 – 30% of population living within 500 ft. of a station would use the monorail), and estimated Convention Center ridership.

Capital cost estimates for the system components were developed in a low-to-high range, based on 3 ridership cases (22,000, 30,000, and 60,000 daily riders). Capital costs ranged from \$80 million to \$115 million. Operating and maintenance costs ranged from \$3.0 to \$4.8 million.

EVALUATION CRITERIA

General professional judgement.

RECOMMENDATIONS/CONCLUSIONS

No clear conclusions were drawn in the Monorail Study. However, the study did note areas of potential difficulty, they included financial, political, and possibly environmental.

Since this 1994 study, a ballot initiative was passed to study an extension of the monorail, which was not specifically tied to the Seattle Commons Plan. The initiative supported a much larger system, extending from the northern city limits to the southern city limits. Results of the ETC will be discussed in detail next.

IMPLEMENTATION

No recommendations to implement.

Comprehensive Plan Compliance

Monorail facilities and their locations are not specifically address in the Comprehensive Plan. However, it does appear that a portion of the proposed alignment would be on Fairview Avenue, a noted Transit Priority Street.

Comprehensive Plan Compliance

Not applicable to this study.

RELEVANCE TO ICT PROJECT

The scope of this study was tied directly to the since defeated Seattle Commons Plan and thus, limited alternative alignments to those in the Denny Regrade area and did not address circulation in the downtown as a whole.

12. ELEVATED TRANSPORTATION COMPANY, CHARRETTE REPORT, AUGUST 1998

OVERVIEW

This document presented the results of an ETC charrette outlining the objectives and roles of the ETC under Initiative 41 and the risks, financing options, lender and investor requirements, project delivery options, and a list of potential project/proposal evaluation criteria.

As part of this exercise, a list of components was developed to consider what makes a project “doable.” The components of a doable project included: 1) The economics of the project must work; 2) Right-of-way must be available at no cost; 3) The project must have champions; 4) environmental clearances must be achievable; 5) there must be no significant political stumbling blocks; 6) there must be a solid legal procurement-and-concession process.

EXISTING CONDITIONS & TECHNOLOGY

The existing monorail system runs from the Westlake Center, at 4th Avenue and Pine Street, to the Seattle Center at Broad Street and 5th Street, and is just under 1 mile in length.

Transit technology is elevated, rubber tired, electronically-powered, unspecified as to type or vendor

DATA SOURCE/ASSUMPTIONS

As this charrette did not address a specific project, but address the elements of a project proposal and an example project, no ridership or cost data were presented.

However, theoretical assumptions on ridership (7,000 – 10,000 daily), capital costs (\$35-50 million/mile), operations and maintenance costs (\$3.5-5 million/year), fares (\$1-2/ride), advertising (\$500,000/year), benefit assessment (10% of passenger revenues), and property development (\$2 million) were included to assess the financial feasibility of a potential/example monorail project.

PROPOSED EVALUATION CRITERIA

System Criteria

- Short Headways/Low Trip Times - required
- Automation - required
- Safety – technological emphasis on safety
- Availability/Reliability/Failure Tolerant – 99.5% reliable
- Capacity/Train Size/Speed – flexibility in system
- Geometric/Configuration Constrains – must be taken into consideration
- Expandability – capacity and coverage

- Reasonable Capital and Operations & Maintenance Costs – should be cost effective for the service intended.

Project Criteria

- Community Acceptance – positive response in terms of image and fit into community
- Minimum Impacts – noise, visibility, community, and other environmental impacts
- Noise – maybe a trade off between speed/service
- Visual – minimize
- Image – sleek, modern vehicles with a “high-tech” image
- Area/Development Fit – size and scale should fit will into the area being served (a large vehicle system wouldn’t fit well in available ROW of the more built-up areas)
- Service Levels – high levels of service (frequent trains, sufficient capacity, area and station coverage that take riders close to their real origins and destinations).

Team Criteria

- Technological Maturity – proposed technology must be proven in either existing/previous passenger service or test-tracked under service conditions)
- Experience with Similar Projects – supplier, and most of the team, should have built a transportation project before
- Financial Capability – supplier must be able to obtain performance bonds and cover short-term float
- Longevity – supplier and technology should have a verifiable longevity based on history and general health
- Match of acceptable technology, management, design/build, and operations and maintenance organizations – team balance is important

RECOMMENDATIONS/CONCLUSIONS

The ICT identified that the project delivery option of choice is a franchise with a blend of private and public funding. How to best attract investor and lender interest in providing transportation alternatives. The most helpful and effective government partnership roles and responsibilities.

IMPLEMENTATION

Not applicable to the ECT charrette findings.

Comprehensive Plan Compliance

Not applicable to the ETC charrette findings

RELEVANCE TO ICT PROJECT

The information presented by the ETC in this charrette will be very helpful in further evaluations of potential ICT routes and technologies. Identified or proposed ICT routes should be mindful of the proposed evaluation criteria developed by the ETC.

13. ELEVATED TRANSPORTATION COMPANY, REQUEST FOR EXPRESSION OF INTEREST, MARCH 1999; AND REQUEST FOR PARTNERSHIP, OCTOBER 1999

OVERVIEW

The ETC was seeking partners for a franchise or franchises to design, construct, test, operate and maintain an elevated public mass transit system in the City of Seattle.

The corridors addressed include:

- ◆ Lake City – Northgate – Ballard – Queen Anne – Westlake - Downtown Seattle. This route also includes a southerly section, traveling through Downtown Seattle, King Street Station, Stadium, SODO to West Seattle (approximate end point California Ave. SW and Fauntleroy Way SW)
- ◆ Sand Pt/Laurelhurst – University of Washington – University District – Wallingford – Ballard – Shilshole
- ◆ Downtown Seattle Corridor/Circulator (Ferry terminals, Stadium, Int'l District, First Hill, Seattle Center)
- ◆ Downtown Seattle – Capitol Hill, via Pike, Pine, Broadway and 1st Avenue.

Compared to the Seattle Commons Monorail study by TDA, the ETC plan is much more ambitious, covering significantly more area and encompassing many more routes. Additionally, in some instances the routes are discrete from one another and it appears that the ECT is willing to allow development to happen based on discrete corridor selection and not through system-wide phasing of development and implementation.

EXISTING CONDITIONS & TECHNOLOGY

The existing monorail system runs from the Westlake Center, at 4th Avenue and Pine Street, to the Seattle Center at Broad Street and 5th Street, and is just under 1 mile in length.

Transit technology is elevated, rubber tired, electronically-powered, unspecified as to type or vendor

DATA SOURCE/ASSUMPTIONS

Data for ridership, capital, or operating and maintenance cost were not presented in these documents, nor were they available on the ETC website.

EVALUATION CRITERIA

The Request for Partners document was prepared with technology and corridors already selected – no criteria were presented.

RECOMMENDATIONS/CONCLUSIONS

Request for Partners document presents corridor selection, but does not included information on how those corridors were selected.

IMPLEMENTATION

None of the recommendations/conclusions have been implemented.

Comprehensive Plan Compliance

Monorail facilities and their locations are not specifically address in the Comprehensive Plan. However, corridors selected through the ETC process are noted as Transit Priority Streets in the City of Seattle Comprehensive Plan.

RELEVANCE TO ICT PROJECT

The ETC has provided ideas on corridors and potential technologies that can be considered in further ICT study.